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ABSTRACT

Using 280 5th graders as subjects, an experiment was carried out to answer the following questions: (1) do certain indentified television formats have effects on cognition? (2) Is mastery of various cognitive skills correlated with extraction of knowledge from a television message which employs the corresponding format? It was hypothesized that: (1) if a television message is heavily loaded by a particular format, then extraction of knowledge from the message depends on one's initial mastery of the cognitive skill which is hypothesized to be needed; (2) if the same message is coded in a different way, mastery of another mental skill correlates with the extraction of knowledge; and (3) when the message supplants the skill, no such correlation with the corresponding skill occurs. The experiment supported the first hypothesis and, in part, the second. The third hypothesis received strong support. In addition, the experiment demonstrated that the television formats identified were critical to cognition, different formats tapped different cognitive skills, and various television formats were expected to have cognitive developmental effects. (HAB)

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ANNUAL REPORT

ON THE SECOND YEAR OF RESEARCH

ON

COGNITIVE EFFECTS OF MEDIA

by

Gavriel Salomon

The Hebrew University of Jerusalem

Submitted to the Spencer Foundation

31 October, 1975

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Introduction

It will be recalled that the overall objectives of the project were (a) to examine the extent to which exposure to TV, that is - to its critical "language" codes and formats, affects children's mastery of cognitive skills pertaining to the demands and to the mentally supplanting models of the medium (a cross-cultural study) (b) to examine the extent to which activities of "encoding" have instructionally different cognitive effects than activities of guided "decoding" (an experiment in schools).

The first year of the project was devoted to theoretical considerations and clarifications.[1] First, the question as to how media affect cognitions was examined in depth. Second, a definition was formulated as to the nature of those TV formats which are critical from a cognitive-development point of view.

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[1] The reader is referred to the Annual Report of the First Year, Sept. 1974.

Third, a list of such formats was constructed accompanied by descriptions of the cognitive skills, hypothesized to be affected by them.

These activities led to two new, but crucial questions: (a) Do the identified TV formats meet our conditions of criticalness, i.e. are they indeed critical in terms of their potential effects on cognitions? (b) are the cognitive skills, identified by us relevant to the extraction of knowledge from TV coded messages, that is - is mastery of any one of these skills uniquely correlated with the extraction of knowledge from a TV message which employs the corresponding format?

The first year of the project ended with the planning of a multi-treatment experiment designed to answer these questions. It will be recalled that such an experiment was not originally included in the project proposal. However, it was felt that it was a necessary intermediate step without which continuation of the project would not be warranted.

The Experiment

The major hypotheses of the experiment were as follows: (a) If a TV message is heavily loaded by a particular format (e.g. space is constantly fragmented), then extraction of knowledge from this message should depend on one's initial mastery of the cognitive skill which is hypothesized to be needed for that process. That is, the skill is called upon by the format, and its initial mastery should correlate with

amount of extracted knowledge from the message.

(b) If the same message is coded in a different way (i.e. another format is used, such as the introduction of logical gaps instead of the fragmentation of space) mastery of another mental skill should correlate with the extraction of knowledge.

(c) This is the case when a format calls upon a skill. When, however, the message supplants the skill, rather than calls upon it, no such correlation with the corresponding skill should occur.

According to our rationale, empirical support of these hypotheses would allow us to conclude that the "format is the cognitive skill", i.e. the same message, differentially coded, taps different cognitive skills in the service of extracting knowledge from it.

The following TV formats, and their hypothesized corresponding skills were sampled for experimentation:

The Format	The Skill
On the level of notationality:	
- concreteness of perceived message	- inference making
On the level of the shot:	
- the zoom	- relating parts to perceptual and/or perceptual wholes
- the close up	

The Format	The Skill
On the level of the sequence:	
- logical gaps in plot	- bridging logical gaps
- fragmentation of spaces	- coordination of spaces
- high information loading in time/space unit	- visual memory
On the level of programming:	
- variability of unrelated messages	- preference for the complex

Five versions of the same short feature film were shot on videotape. The first version was as neutral, in terms of utilized formats, as possible (version "0"). The second version was based on numerous close-ups (CU version), while the third was identical but for the replacement of close-ups with zoom-in and zoom-out movements of the camera lens (the "Zoom" version). It will be noted that while the CU version was expected to call upon one's ability to relate parts to wholes, the Zoom version overtly supplanted this skill. Hence, whereas, a correlation between skill and amount of extracted knowledge was expected in the CU version, no such relationship was expected where the Zoom version was shown.

The fourth version utilized fragmented spaces (the FG version), and the fifth provided logical gaps in the plot (the LG version).

The sixth version displayed variability: It showed six very short and completely unrelated stories. It thus differed

from the other five versions in plot as well as format.

Two hundred and eighty five-graders from the Jerusalem school district took part in the study. Children were randomly assigned to the six groups, each viewing a different version of the film. A battery of tests and measures was administered to all children prior to the presentation of the films. A posttest, measuring the children's amount of acquired knowledge from the films, was administered a day following their presentation.[2]

The pretest battery included background data, information pertaining to the children's televiewing habits, and our test battery of cognitive skills. This battery was administered two months earlier to a pilot sample of children and consequently - changed and improved.

The posttest consisted of multiple-choice questions pertaining to the film's content. However, due to the format differences between the versions, specific groups of questions were format (i.e. version) specific. Thus, e.g. there were questions dealing with space, with logical gaps, with parts and wholes, etc. As part of the posttest, children were also required to reconstruct the plot of the story, thus enabling

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2 A detailed technical report is presently in the writing and will be sent out before long.

us to examine and measure the inferences they generated from the film.

The Characteristics of the Mental Tests

The battery of tests, designed to measure mastery of the relevant cognitive skills identified by us, was developed mainly by us. Some of the measures were used before, while some of the others were modifications of existing tests. The tests were as follows (see appendix A):

(1) Detail & Concept: This test was designed to measure the child's ability to identify a missing element in a pictorial display, conceptualize it, and identify the relevant missing part in another drawing. Thus, e.g. there was a drawing of children on a hike, arguing, and observing a missing object. This object, a map, appeared among many other objects, in another drawing.

The test contained 5 items. Alpha Cronbach Reliability: .57.

(2) Preference for Complexity: This test was based on the works by Berlyne (1965) and by Munsinger, Kessen & Kessen (1964). The child was given a pair of drawings about the same topic. One of the pair was simple, with only a few details, while the other contained many more, and not always congruous details. The child had to indicate which of the two he preferred.

There were 10 items. Reliability was .71.

(3) Closing Gaps - Visual Test: The test measured the child's ability to correctly choose and insert in a series of drawings other drawings which closed gaps between elements. Thus, there were two series: the one which "told a story", but elements were missing from it, and the other from which specific drawings were to be selected and correctly placed in amongst the drawings of the first series.

There were 5 items. Reliability was .69.

(4) Closing Gaps - Verbal Test: The test was identical to the visual test, but for the replacement of drawings by sentences.

There were 5 items and the reliability was .76.

(5) Detail & Whole: While test No. 1 measured one's ability to relate details to conceptual wholes, this test measured the ability to relate details to perceptual wholes. A similar test was used by Ball & Bogatz (1970) in their evaluation of Sesame Street, and later by Salomon et al. (1975) in their study of that program.

The child saw an enlarged detail of a drawing and had to relate it to the correct whole drawing to which it belonged.

There were 10 items, and the reliability was .77.

(6) Analogies: This test was taken from the MILTA, the Israeli standardized intelligence test. It measures one's verbal-logical ability.

There were 8 items, and the reliability was .54.

(7) Visual Memory: The child was shown for 20 seconds a drawing, very rich with details, and had then to recall as many details as possible.

There were two such drawings, and the reliability was .74.

(8) Space Construction: The test was designed to measure the child's ability to interrelate four separate components of a drawn space (e.g. a room) and correctly place them in a given area.

There were four items, and the reliability was .75.

The intercorrelations between the eight tests are shown in table 1.[3] As it can be seen, the two tests which measure closing gaps (Nos. 3 & 4) intercorrelate quite well (.51), but not enough to make one of them redundant. It is interesting to note that the two tests of verbal ability (Nos. 4 & 6) correlate modestly among themselves. They also correlate with some of the other tests, suggesting that at least part of the

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3 Most correlations are statistically significant as N = 280. Hence, we dealt only with correlations of .30 and higher.

Table 1: Intercorrelations Among the Cognitive Skills Tests

	1	2	3	4	5	6	7	8
1. Detail & Concept	1							
2. Complexity	.090	1						
3. Gaps - Visual	.26	.09	1					
4. Gaps - Verbal	.26	.06	.50	1				
5. Detail & Whole	.23	.01	.36*	.32*	1			
6. Analogies	.18	.09	.34*	.44*	.33*	1		
7. Visual Memory	.24	.02	.10	.06	.13	.10	1	
8. Space Construction	.30	.09	.35*	.30	.28	.31*	.17	1

children solve visual items while using apparently internal verbalization. This is particularly the case with the Space Construction Test, indicating that the spatial ability measured is not unrelated to verbal ability, a point often mentioned in the literature (e.g. Huttenlocher, 1968).

The tests have been factor analyzed. The analysis yielded 10 factors for the eight tests. Six of the tests loaded each on a separate, and "clean" factor, while the two remaining tests - Complexity and Analogies - loaded each on two factors. There were no loadings of one test item on a factor heavily loaded by another test. Thus, it appeared that the eight tests were different from each other to a satisfactory degree, and had satisfactory validity inasmuch as the items in each test measured the same skill.

Results of the Experiment

For the sake of brevity, only major results will be briefly reported here. Table 2 summarizes the correlations between the mental-skill pretests and the posttest measures of extracted knowledge separately for each version. It should be noted that, as described earlier, there were different groups of posttest items, each pertaining to the specific nature of the corresponding version. There were no particular correlations expected in the "O" (no specific format) version, and none were obtained. Indeed, where a film is as neutral as

Table 2: Correlations Between Pre- and Posttests for Each Version

Pretest \ Version	"O"	Zoom	CU	FS	LG	Variab.
Detail & Concept	.01	.27	.67*	.31*	.40*	.10
Complex.	-.04	.01	.69**	.05	.15	-.11
Gaps-Visual	.26	.04	.18	.31*	.35*	.34*
Gaps-Verbal	-.08	.06	.17	.23	.19	.38*
Detail & Whole	-.02	-.04	.32*	.10	.17	.42**
Analogies	.14	-.01	.01	.31**	.10	.39**
Memory	-.01	-.03	.33*	-.15	.32*	.18
Space Construction	.29	.07	.33**	.14	.26	.30

—— The line under a coefficient indicates that a correlation was expected.

* The aestric indicates that an expected correlation was obtained. Note: Only correlations above .30 are taken as high enough for consideration.

** A non expected correlation was obtained.

possible, in terms of the formats into which its messages are coded, no specific mental skill, of the ones measured here, is particularly needed for the extraction of knowledge.

The two twin versions - Zoom & CU - differ only inasmuch as the Zoom provides (i.e. supplants) the bridge between two shots, while the CU does not. The correlation patterns obtained in these two groups are rather intriguing. Extraction of knowledge from the CU version is heavily dependent on the mastery of several cognitive skills, as expected, indicating that this format calls upon these skills. Children who initially master them better have an advantage, in terms of knowledge extraction, over those with poor mastery. The extraction of knowledge in the Zoom version, on the other hand, does not rely so heavily on the mastery of the measured skills, as this format overtly supplants for the children the necessary skills. These findings are very much in line with previous ones (Salomon, 1974; Rovet, 1974).

It is interesting to note that the extraction of knowledge from the CU version heavily relies on one's preference for complexity (a correlation of .69). It seems that the test, as well as the extraction of knowledge from CU tap the same mental tendency, namely one's preference for the detail-rich message. If this is what the preference for Complexity Test measured, no wonder it did not correlate with the extraction of knowledge from the Variability version.

In sum then, it appears that the format of Close-Up calls upon one's skill in relating details to concepts, relating details to perceptual wholes, one's preference for the detailed & complex, visual memory, and space construction ability. Since these skills intercorrelate rather poorly (see table 1) it can be concluded that CU calls upon a number of discrete skills in the service of extracting knowledge.

Extraction of knowledge from the FS version was initially expected to correlate with one's skill in Space Construction. Such a correlation was not obtained. However, there appeared mild correlations between knowledge extraction and the skills of relating details to concepts, closing visual gaps and logical analogies. These three measures tend to intercorrelate (table 1). It thus seems that the FS version calls for more logical-visual skills than for spatial ones, in spite of the fact that this format disrupts deliberately space presentations.[4] However, since Space Construction Test scores correlate both with the Closing Gaps--Visual Test scores and with scores on the Analogies Test, we must conclude that the so-called spatial ability as measured by us relates to both components. Each of these components correlated, as noted, with performance on the FS version. In sum, the FS format does not seem to call upon any

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[4] This version was also expected to affect children's ma drawing ability à-la-Feldman, thus to serve as a partial crystallyzer. Data is presently being analyzed.

separate skill but upon a combination of visual-logical skills.

The LG version, as expected, calls upon one's ability to close logical gaps, and infer concepts from details. Performance also relies on one's visual memory. Interesting enough, closing gaps verbally is not called upon, although this was expected.

Finally, the extraction of knowledge from the Variability version, had much in common with both perceptual as well as logical skills. We expected a correlation also with one's preference for complexity, but - for reasons already mentioned - it was not obtained. Clearly, a film in which contents and formats constantly vary, tempts a child to relate contiguous stories to each other, in spite of the fact that they are unrelated to each other. It is therefore interesting to note that children utilize their skill of bridging ogical gaps, as well as perceptual skills, to overcome the constraints of the format.

Conclusions

The experiment lended support for our first hypothesis. There is ample evidence in the study to show that a message, coded by means of different formats, calls upon different patterns of mental skills. Support for our second hypothesis is only partial. We did not find a one-to-one correspondence

between formats and skills. There were skills which appeared to be called upon by more than one format (particularly the skill of relating a detail to an inferred concept). Other skills (notably - verbally closing logical gaps, and space construction) appeared to serve the extraction of knowledge from formats others than the ones we have hypothesized.

The third hypothesis received strong support, as evidenced by the different correlational patterns which emerged under the Zoom and the CU conditions.

Aside of this, the experiment demonstrated that: (a) The TV formats we have indentified and studied are critical (according to our initial criteria) in terms of the cognitions they arouse; (b) The formats into which a TV message is "dressed", make a significant difference in terms of the cognitive skills they tap; and (c) These formats, as well as others may be expected to have cognitive developmental effects.

Plans for the Third Year

Having carried out the experiment, the road is paved for the remaining two phases of the project: The cross-cultural study, and the experiment in the schools.

As for the cross-cultural study, the battery of mental-skill tests developed by us will be used, after proper corrections and improvements are introduced. There remains,

however, to be finalized the measurement of relevant background variables and the measurement of exposure to TV. As Dr. D. Feldman of Tufts University is willing to cooperate with us, we plan on testing children in the Boston area.

The study should be finished in the spring of 1976.

The experiment in the schools will, apparently, be delayed until the beginning of the 1976/7 school year. The reason is that the experiment calls for more careful preparation, training of teachers, acquisition of equipment, and the like. It does not seem desirable, contrary to initial plans, to carry the experiment out at the same time that the cross-cultural study is conducted.

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